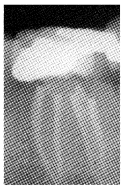

CASE REPORT

Neurological complications following extrusion of sodium hypochlorite solution during root canal treatment

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Abstract

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Aim To report the presentation and management of two cases with neurological complications secondary to the extrusion of sodium hypochlorite solution into the facial soft tissues during root canal treatment.

Summary The clinical features, with particular emphasis on nerve deficit following inadvertent extrusion of sodium hypochlorite, are discussed and its management highlighted. Early and aggressive treatment is advocated following such incidents in order to reduce potentially serious complications.

Key learning points

- Neurological sequelae can follow inadvertent hypochlorite extrusion.
- Early recognition may avert a potentially more serious outcome.
- Active hospital treatment including intravenous steroids and antibiotics is recommended.

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Keywords: endodontics, hypochlorite, nerve damage, root canal treatment.

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Introduction

Root canal treatment is a routinely practiced clinical procedure with few reported complications (Wong 2004). Although sodium hypochlorite solution is often used as an irrigant during this procedure without complications (Clarkson & Moule 1998), severe sequelae may occur if this solution is extruded beyond the root apex. The resulting soft tissue damage that can occur is well recognized, but facial nerve weakness following sodium hypochlorite extrusion during root canal treatment has not been previously described.

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Case 1

A 43-year-old female patient was urgently referred to an oral and maxillofacial consultant surgeon with right sided facial swelling and severe pain following root canal treatment by her general dental practitioner. Root canal treatment had been commenced 2 days earlier under rubber-dam isolation, on tooth 12 (FDI), which had a buccal discharging sinus. The root canal system had been irrigated with 10 mL of sodium hypochlorite of unknown concentration using an irrigation needle of unknown size. During the irrigation, the patient experienced severe sudden pain and cheek swelling, which occurred rapidly within a few minutes. Treatment was immediately aborted, antibiotics were prescribed and a review appointment was arranged. However, her facial pain and swelling worsened significantly over the next 24 h, resulting in the patient self presenting herself to the hospital.

On clinical examination approximately 50 h after the incident, there was a firm right-sided facial swelling, which extended from below the border of the mandible up to the right eye (Fig. 1a). Right infra-orbital nerve paraesthesia was noted together with weakness of the buccal branch of the facial nerve, resulting in some loss of upper lip and cheek function. Mouth opening was limited to 20 mm and intra-orally marked necrosis of the labial mucosa and ulceration of the mucosa of the maxillary alveolus around tooth 12 was seen.

The patient was admitted to hospital and given intravenous dexamethasone (8 mg thrice a day for 2 days), and intravenous amoxicillin (1.0 g thrice a day also intravenously) together with regular oral analgesia (diclofenac, 50 mg thrice a day) for 2 days. The swelling and pain gradually decreased over the next 2 days, although there was extensive facial skin bruising and no necrosis developed. Following hospital discharge, the patient was reviewed regularly in the outpatient clinic. At 1 month, the swelling had almost completely resolved, mouth opening was gradually improving and the patient was pain free. The area of infra-orbital nerve paraesthesia had decreased since her original admission. However, there was no improvement of her buccal-branch facial nerve weakness, with persisting loss of the nasolabial grove and the down-turning of the angle of the mouth still evident (Fig. 1b). No surgical intervention was necessary. Complete resolution of her facial weakness occurred approximately 6 months after the incident.

Case 2

A 44-year-old female patient presented with a severely painful and swollen right cheek, following routine root canal treatment of tooth 15. During this procedure sodium hypochlorite solution, which had been used to irrigate the root canal, had extruded through the apex into the surrounding soft tissue (concentration, volume and irrigation needle size unknown). The patient had experienced immediate severe pain and cheek swelling, and the general dental practitioner had abandoned the procedure. The patient self presented to hospital. On clinical examination approximately 6 h after the incident, there was marked swelling over the right side of the face (Fig. 2a). Loss of sensation in the infra-orbital nerve distribution was noted together with weakness of the buccal branch of the facial nerve, resulting in drooping of the right corner of the mouth (the corner of the mouth was pulled down by the unopposed lower lip musculature). Unlike case 1, there was no evidence of soft tissue damage intra-orally. The patient was treated with the same regime as in case 1 and following discharge at 2 days, was reviewed at regular weekly intervals in the outpatient clinic. At 1 month, the facial nerve weakness had significantly improved, although she still reported marked paraesthesia of the upper lip on the right side. Both lip paraesthesia and facial weakness had completely resolved some 3 months after the original incident.

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Figure 1 (a) Initial presentation of case 1 with swelling and ecchymosis. (b) Appearance of case 1 at 1 month. Note the loss of nasolabial grove and down-turning of the right angle of mouth, as a result of persisting buccal-branch facial nerve weakness.

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Figure 2 (a) Initial presentation of case 2 with swelling, ecchymosis and weakness of the buccal branch of the facial nerve. (b) Appearance of case 2 at 1 month.

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Discussion

Sodium hypochlorite (bleach solution) is a cytotoxic agent (Gatot *et al.* 1991, Gernhardt *et al.* 2004). When it comes into contact with vital tissue, it causes haemolysis, ulceration, inhibits neutrophil migration and damages endothelial and fibroblast cells (Gatot *et al.* 1991).

The appearances in these two cases were consistent with the severe tissue damage that is associated with a chemical burn following extrusion of sodium hypochlorite into the periapical tissues. As the apical anatomy of the teeth being root treated appeared normal on routine radiographs, it is likely that the combination of periapical bone destruction because of chronic infection and increased pressure irrigation lead to entry of sodium hypochlorite into the adjacent soft tissues. It is also possible that intracanal bacteria would be carried into the tissues, thereby posing a potential infection risk.

Intravenous steroids were administered in these cases empirically because of the rapidly arising painful firm swelling, which continued to increase in size. Although there are no clinical studies that have documented their efficacy in these situations, the profound anti-inflammatory properties of this group of drugs are well documented and there use has been previously reported (Gatot *et al.* 1991). The use of antibiotics is routinely recommended in these incidents because of the presence of necrotic tissue and the risk of infection. Although it is possible that these patients could have been managed as out-patients, hospital admission and aggressive supportive measures may have contributed to close monitoring and favourable clinical outcomes.

There are only a small number of cases in the literature that have reported postoperative skin complications and altered nerve sensation (Reeh & Messer 1989, Serper *et al.* 2004) arising from the use of sodium hypochlorite in root canal treatment. However, these two cases demonstrate that extrusion of sodium hypochlorite solution can also cause facial nerve weakness. Both cases were likely to be due to hypochlorite-related damage rather than soft tissue oedema, as acute dental abscesses with rapidly developing facial swelling are not usually associated with either sensory or motor deficit.

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This report serves as a useful reminder of the potential hazards associated with sodium hypochlorite solution and describes the neurological complications that can occur with its misuse, including isolated facial nerve weakness. Fortunately these patients did not require any surgical intervention although the presentations had been delayed, the risk of infection, worsening oedema and soft tissue necrosis could have been much worse.

Conclusions

Sodium hypochlorite extrusion can cause facial nerve weakness in addition to other soft tissue damage. Early recognition of this problem and prompt management may reduce further complications.

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